Southwest Power Pool

Facility Study
For
Generator Interconnection Request
GEN-2014-012
(IFS-2014-001-06)

SPP Generator Interconnection Studies

(#GEN-2014-012)
(#IFS-2014-001-06)

June 2015

Revision History

Date	Author	Change Description
02/13/2014	SPP	Draft Facility Study Report Issued
03/20/2015	SPP	Facility Study Revision 1 Report Issued
04/28/2015	SPP	Draft Facility Study Revision 2 Report Issued
06/01/2015	SPP	Facility Study Revision 2 Report Issued

Summary

Southwestern Public Service Company (SPS), an operating company subsidiary of Xcel Energy Inc., performed a detailed Facility Study at the request of Southwest Power Pool (SPP) for Generation Interconnection request GEN-2014-012/IFS-2014-001-06 (186.0MW/Summer Peak and 225.0MW/Winter Peak) located in Gaines County, Texas. Interconnection Customer, GEN-2014-012/IFS-2014-001-06 is an Energy Resource Interconnection Service (ERIS) only SPP GI Interconnection Request. GEN-2014-012/IFS-2014-001-06 originally requested an in-service commercial operation date of June 1, 2018. SPP has proposed the in-service date will be after the assigned Interconnection Facilities and Non-Shared Network Upgrades are completed. Full Interconnection Service will require the Network Upgrades listed in the "Other Network Upgrades" section. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Phases of Interconnection Service

It is not expected that interconnection service will require phases however, interconnection service will not be available until all interconnection facilities and network upgrades can be placed in service.

Interconnection Customer Interconnection Facilities

The Interconnection Customer's generation facility consists of one (1) Gas Combustion Turbine for a total generation capacity of 186.0MW Summer Peak and 225.0MW Winter Peak. The 18kV generation voltage is planned to be connect to one (1) 345/18kV Interconnection Customer owned and maintained step-up transformer at the Interconnection Customer owned substation. A 345kV transmission circuit approximately six (6) miles long will connect the Interconnection Customer owned substation to the new SPS owned Sidewinder 230kV Switching Station. This new Switching Station will tap the existing Hobbs – Andrews 345kV transmission line (currently operated at 230kV)[1]. The new Sidewinder 230kV Switching Station (to be constructed and insulated at 345kV) will be approximately 18 miles from the Hobbs Substation on the Hobbs – Andrews transmission circuit. When Hobbs – Andrews 230kV is converted to 345kV, the Interconnection Customer will be responsible for converting their facilities at their own expense to accommodate the voltage conversion. The Interconnection Customer will be responsible for all of the transmission facilities connecting the customer owned substation to the Point of Interconnection (POI), at SPS owned 345kV bus at the new Sidewinder 345kV Switching Station. The Interconnection Customer will also be responsible for any equipment located at the Customer substation necessary to maintain a power factor of 0.95 lagging to 0.95 leading at the POI.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

To allow interconnection the Transmission Owner will need to construct a new three (3) breaker ring bus built at 345kV but operating at 230kV substation and associated terminal equipment to allow for acceptance of the Interconnection Customer's Interconnection Facilities. SPS has estimated a lead time of thirty-six (36) months after a fully executed Generation Interconnection Agreement (GIA) to complete the Sidewinder Switching Station Facilities and Upgrades.

[1] The SPS Facilities Study indicates that the Hobbs-Andrews 230kV line could possibly be converted to 345kV operation after the in-service date of the GEN-2014-012 Interconnection Request. This work, which is described on pages 2-3 of the SPS study, does not have a Notification to Construct (NTC) at the time of the posting of this study report. .

GEN-2014-012/IFS-2014-001-06 was originally studied in the SPP Generation Interconnection Impact Study DISIS-2014-001. Due to higher queued Interconnection Customers and the need for their assigned Network Upgrades withdrawing from the SPP GI Queue along with a SPP Generation Interconnection queue amount reduction; a restudy of DISIS-2014-001 (DISIS-2014-001-1) was performed. As a result of the restudy, a Non-Shared Network Upgrade of rebuilding National Enrichment Plant – Targa – Cardinal 115kV was identified as an injection constraint for GEN-2014-012/IFS-2014-001-06. This constraint was included in the 2015 ITP Near Term that was approved by the SPP Board of Directors in January, 2015. As such, this upgrade will receive a Notification to Construct (NTC) and the Interconnection Customer will not be responsible for this upgrade. At this time GEN-2014-012/IFS-2014-001-06 is responsible for $10,966,268 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. Table 1 displays the estimated costs descriptions for Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

Table 1: GEN-2014-012/IFS-2014-001-06 TOIF and Non-Shared Network Upgrades

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
Interconnection Substation - Transmission Owner Interconnection Facilities 345kV built 230kV operating Substation work	$337,375	100%	$337,375
Interconnection Substation - Network Upgrades 345kV built 230kV operating Sidewinder Switching Station and Hobbs – Andrews transmission circuit work	$10,628,893	100%	$10,628,893
Total	$10,966,268	100%	$10,966,268

Shared Network Upgrades

At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrades. If higher queued interconnection customers withdraw from the queue, suspend or terminate their GIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of Shared Network Upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests being placed in service. At this time, the Interconnection Customer is allocated the following cost for Shared Network Upgrades.

Table 2: GEN-2014-012/IFS-2014-001-06 Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
Currently GEN-2014-012/IFS-2014-001-06 is not allocated Shared Network Upgrades	$0	n/a	$0
Total	$0	n/a	$0

Other Network Upgrades

Certain Other Network Upgrades are currently not the cost responsibility of the Customer but will be required for full Interconnection Service. Currently, the following Other Network Upgrades are required:

- Hobbs Interchange – Kiowa 345kV circuit #1 build, assigned in SPP High Priority Incremental Loads (HPILs) Study, SPP-NTC-200283[2]. Estimated In-Service date on schedule for 6/1/2018.
- Kiowa – Road Runner 345/230/115kV Project, assigned in SPP High Priority Incremental Loads (HPILs) Study, SPP-NTC-200283. Estimated In-Service date on schedule for 6/1/2018.
- Livingston Ridge – Sage Brush – Lagarto – Cardinal 115kV circuit #1 build, assigned in SPP High Priority Incremental Loads (HPILs) Study, SPP-NTC-200283. Estimated In-Service date on schedule for 6/1/2018.
- National Enrichment Plant – Targa – Cardinal 115kV circuit #1 rebuild, assigned in SPP 2015 ITPNT Study, SPP-NTC-200324. Estimated In-Service Date on 6/1/2015.

Depending upon the status of higher or equally queued customers, the Interconnection Customer's in-service date is at risk of being delayed or their Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades.

Conclusion

Interconnection Service for GEN-2014-012/IFS-2014-001-06 will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades are constructed. The Interconnection Customer is responsible for $10,966,268 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrades. After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 186.0MW Summer Peak and 225.0MW Winter Peak, as requested by GEN-2014-012/IFS-2014-001-06, can be allowed. At this time the total allocation of costs assigned to GEN-2014-012/IFS-2014-001-06 for Interconnection Service are estimated at $10,966,268.

[2] SPP-NTC-200283 Link: http://www.spp.org/publications/NTC-C%20200283%20SPS.pdf

Facilities Study For
Southwest Power Pool (SPP)

186/225 MW Generation Facilities
[Omitted Text], Texas
SPP #GEN-2014-012/IFS-2014-001-6

April 17, 2015

Transmission Planning South
Xcel Energy Services

Executive Summary

("Interconnection Customer") in 2014 requested the interconnection of a new generation facility located in Gaines County, Texas to the Southwestern Public Service Company (SPS) transmission network. SPS is a New Mexico Corporation and wholly owned subsidiary of Xcel Energy Inc. This facility has a net capacity of 186 MW in the summer and 225 MW in the winter. The Interconnection Customer's expected commercial operation date is June 1, 2018 and back-feed date is January 2018.

The Southwest Power Pool (SPP) evaluated the request to interconnect the generator facility to the SPS transmission system in a Definitive Interconnect System Impact Study (DISIS-2014-001-1) GEN-2014-012 completed in October 2014. A revised study was completed February 13, 2015 in #IFS-2014-001-06 where the shared cost was removed. The interconnection request was studied using one (1) Siemens Gas Combustion Generator for a total output of 186 MW. The Interconnection Customer will be required to maintain a Power Factor of 0.95 lagging and 0.95 leading at the Point of Interconnection (POI).

SPP requires that each generator shall implement Automatic Under Frequency Load Shedding (UFLS) according to the SPP UFLS Plan at the following link: http://www.xcelenergy.com/Energy_Partners/Generation_Owners/Interconnections_for_Transmission. To fulfill this requirement, coordination with Xcel Energy is required during the under-frequency relay-setting phase for the generation. The Interconnection Customer is required to report their generation off-nominal frequency tripping relay settings to SPP and SPS. SPS specifies that generators shall not trip at frequencies above 58.5 Hz unless exceptions in the Transmission Provider Criteria are met. The Interconnection Customer agrees that the energy generating units installed at this interconnection will not be tripped for under-frequency conditions above 58.5 Hz in compliance with Transmission Provider criteria. This means that the generation subject to this Interconnection Agreement may not trip for under-frequency conditions on the transmission system until all under-frequency load shedding relays have operated. SPS will also require that the Interconnection Customer be in compliance with all applicable criteria, guidelines, standards, requirements, regulations, and procedures issued by the North American Electric Reliability Corporation (NERC), SPP, and the Federal Energy Regulatory Commission (FERC) or their successor organizations.

Gen-2014-012 will require SPS to construct a new switching station (to be named Sidewinder Switching Station). The new switching station will be constructed at 345 kV but operated at 230 kV as the SPS Hobbs-Andrews transmission line will be converted to 345 kV operation at a future date, but not prior to the connection of this generator. The Interconnection Customer is responsible for the cost of the Interconnection Facilities and installation of the Direct Assigned Interconnection Facilities; inclusive of all construction required for the Gen-2014-012 interconnection to the SPS Sidewinder Switching Station. Gen-2014-012 will initially interconnect to the SPS Sidewinder Switching Station at 230 kV but when the Sidewinder Switching Station is upgraded to operate at 345 kV, the Interconnection Customer will be required, at their own expense, to upgrade all of their facilities needed to accommodate the conversion of the Sidewinder Switching Station to operate at 345 kV.

The new 345 kV Sidewinder Switching Station (operated at 230 kV) will require approximately 36 months to complete after an Interconnection Agreement is signed and an authorization to proceed is received. A Certificate of Convenience and Necessity (CCN) will be required for the generation facility and the new 345 kV transmission line (operated at 230 kV). The cost of these upgrades, inclusive of the Interconnection Customer's cost for the interconnection of this Gas Combustion Generator facility, is shown below in Table 1, with a more detailed description of the cost shown in Table 3.

The current estimated shared network upgrades allocation cost for the new Combustion Turbine Generator project (GEN-2014-012) as calculated by SPP in the IFS-2014-001-06 is $0. The estimated network upgrades for Sidewinder Switching Station at 345 kV, but operated at 230 kV is $ 10,966,268.

Table 1, Cost Summary[a]

Shared Network Upgrades:	**$ 0**
Transmission Owner Network Upgrades:	**$ 10,628,893**
Transmission Owner Interconnection Facilities:	**$ 337,375**
Total:	**$10,966,268**

[a] The cost estimates are 2015 dollars with an accuracy level of ±20%.

General Description of SPS Facilities [2]

1. **Construction of New Gas Combustion Generator and construction of the Sidewinder Switching Station:** See Appendix A, Figure A-1, for general vicinity location map.

   1.1. **Location:** SPS will build a new 345 kV 3-ring bus with 3-breakers and 3-terminals at Sidewinder Switching Station (Operated at 230 kV) expandable to a breaker and half scheme. Appendix A, Figure A-2 shows the one-line diagram of the 345 kV Sidewinder Switching Station (Operated at 230 kV).

   1.2. **Bus Design:** A new 345 kV 3-ring bus design (Operated at 230 kV) will be built for future breaker and half configuration for the new Sidewinder Switching Station. It will accommodate the output from Interconnection Customer's Generation Plant. The one-line diagram is shown in Appendix A, Figure A-2.

   1.3. **Line Terminals:** The 345 kV lines (Operated at 230 kV) and static wire terminals will be designed to accommodate 18,000 pounds per conductor (36,000 per bundle) per phase at maximum tension, with a maximum 15° pull-off angle from normal.

   1.4. **Control House:** The new control house will be utilized to accommodate the new metering, protective relaying and control devices, terminal cabinets, and any fiber-optic cable terminations, etc. for the 345 kV line breaker terminals (Operated at 230 kV).

   1.5. **Security Fence:** The new security fence will have a 7-foot chain-link fence with steel posts set in concrete with 1-foot of barbed wire on the top in a "V" configuration. The enclosed area will be approximately 660' by 660' for Sidewinder Switching Station with a rock yard surface.

   1.6. **Ground Grid**: A complete ground grid shall be installed per ANSI/IEEE STD 80-1986, with our standard 4/0 copper ground mesh on 40-foot centers with ground rods and 20-foot centers in corners and loop outside of fence.

   1.7. **Site Grading:** Company contractor, per company specifications, will perform any site grading and erosion control of the new switching station. Soil compaction shall be not less than 95% of laboratory density as determined by ASTM-D-698.

   1.8. **Station Power:** A 133 kV/120-240volt transformer tapped off of the 230 kV bus will provide station power. A backup station power source will be taken from local distribution if it is available or a generator will be installed if none is available. A flip-flop to automatically transfer the station power will be installed.

[2] All modifications to SPS facilities will be owned, maintained and operated by SPS.

1.9. **Relay and Protection Scheme:** The new Sidewinder Switching Station will be a 345 kV 3-ring bus with 3-breakers and three (3) line terminals (Operated at 230 kV). The primary and secondary lead bus protection for generator relays to the 230 kV bus will be SEL 487B and GE B90, respectively. The line terminal protection will be a SEL-411L and SEL-311C-1. No automatic re-closing scheme will be used on the Sidewinder Switching Station, but the SEL 411L will be wired for future re-closing. Fiber is available on the Interconnection Customer's Generation Plant to Sidewinder Switching Station lines. A SEL 351S will be used for breaker failure. Modifications at SPS' Hobbs & Andrews substations may be required.

An SEL 411L will display the bus voltage, GCB amps, MW, MVAr, and fault location. An SEL 2032 will be installed for relay communications and other functions as required.

1.10. **Revenue Metering:** An individual billing meter will be installed on the 230 kV at Sidewinder Switching Station along with a meter per ANSI C12.1 accuracy class 0.2 (3-PT's IEEE C57.13 accuracy class 0.3 and 3 CT's IEEE C57.13 accuracy class 0.15) for full 3-phase 4-wire metering. Pulses out of the billing meter will be sent via SCADA to the SPS' Control Center in Amarillo, Texas.

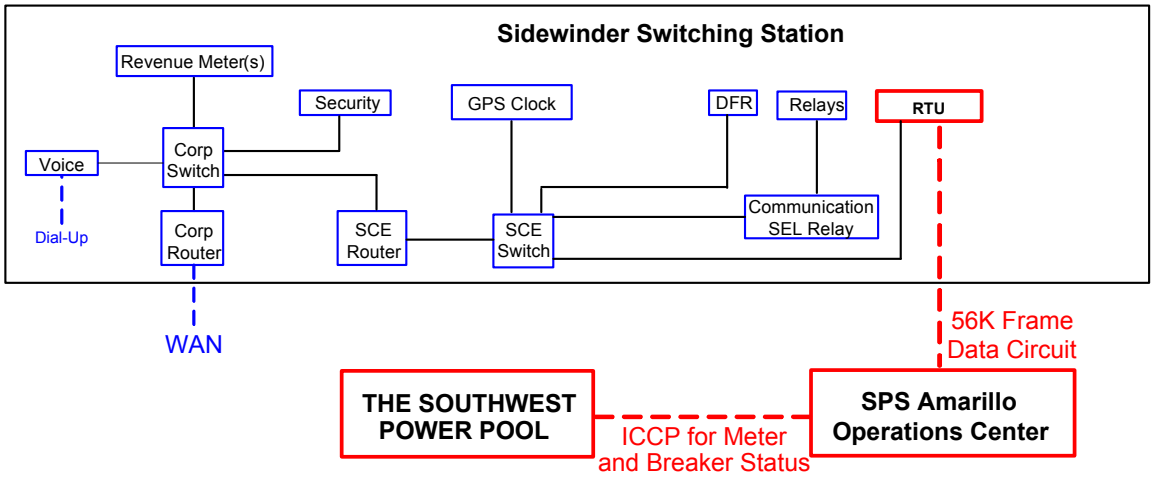
1.11. **Disturbance Monitoring Device:** A Disturbance-Fault Recorder ("DFR"), capable of recording faults, swings, and long term trending, will be installed to monitor and record conditions in the substation and on the transmission lines. The disturbance equipment shall also be equipped with a GPS time synch clock. This equipment will have communication capability with a dedicated communication circuit. The disturbance equipment will have its own dedicated dial-up communications telephone circuit.

1.12. **Remote Terminal Unit ("RTU"):** A RTU will be installed to accommodate the new 345 kV line terminals (Operated at 230 kV) at the Sidewinder Switching Station. SPS will install RTU cards for metering and telemetry as required by the latest Xcel Energy Interconnection Guidelines. The direct cost will be charged to the Interconnection Customer.

1.13. **Communications:** To meet its Communications obligations, the Interconnection Customer shall be responsible for making arrangements with the local phone company to provide telephone circuits as required by the Transmission Owner. Transmission Owner equipment may include, but is not limited to, the following: relay communication equipment, RTU, and disturbance monitoring equipment at the new Sidewinder Switching Station. Prior to any construction, the Interconnection Customer is required to contact the Transmission Owner substation-engineering department for all communication details.

The following communications schematic diagram, which includes communication equipment information for the Interconnection Customer, Transmission Provider (Southwest Power Pool) and Transmission Owner (Southwestern Public Service), is provided to assist the Parties.

A schematic outlining the proposed communications is provided below:



The Interconnection Customer shall be responsible for providing fiber optic communication circuit installed in their overhead transmission line static wire for protective relaying from the Interconnection Customer's Generation Plant to Sidewinder Switching Station indicated in Section 1.9.

2. **Transmission Work:**

2.1. The Interconnection Customer will construct, own, operate, and maintain any customer owned 345 kV transmission line (Operated at 230 kV) from the Interconnection Customer's substation to the Point of Interconnection at SPS Sidewinder Switching Station. **The SPS transmission design group prior to any construction by the Interconnection Customer or its contractor on any customer 345 kV transmission lines, or doing work in close proximity to any SPS transmission line, will require an engineering review of the customer's design. It is the Interconnection Customer's responsibility to initiate the design review in a timely manner before construction of any transmission line begins. If the review has not been made or the design at any of the aforementioned locations is deemed inadequate, the crossing(s) and or termination into the interchange will be delayed until the matters are resolved. SPS will not be held responsible for these delays.**

3. **Right-Of-Way:**

3.1. **Permitting**: The interconnection customer will be responsible for any permitting for the construction of a new 345 kV substation (Operated at 230 kV) at Interconnection Customer's Generation Plant is required from the Public Utility Commission in the State of Texas and the State of New Mexico. A Certificate of Convenience and Necessity (CCN) will be required for the generation facility.

3.2. **Permitting**: The interconnection customer will be responsible for any permitting and right of way for the construction of a new 345 kV line (Operated at 230 kV) from Interconnection Customer's Generation Plant Substation to new Sidewinder Switching Station is required from the Public Utility Commission in the State of New Mexico. A Certificate of Convenience and Necessity (CCN) will be required for the new 345 kV transmission line (Operated at 230 kV).

4. **Construction Power and Distribution Service:** It is the sole responsibility of the Interconnection Customer to make arrangements for both construction and station power, which may be required for the Interconnection Customer's generation facility. **Additionally, if the Interconnection Customer's substation(s) and/or construction site(s) are located outside of the SPS service area, SPS cannot provide station power (retail distribution service) and the Interconnection Customer needs to make arrangements for distribution service from the local retail provider.**

5. **Project and Operating Concerns:**

5.1. Close work between the Transmission group, the Interconnection Customer's personnel and local operating groups will be imperative in order to meet any in-service date that has been established

5.2. The Interconnection customer will be required to maintain a Power Factor of 0.95 lagging and a 0.95 leading at the Point of Interconnection (POI). This is required to maintain acceptable dynamic voltage rise as per latest revision of the Xcel Energy Interconnection Guidelines for Transmission Interconnection Producer-Owned Generation Greater than 20 MW, is available at:
http://www.xcelenergy.com/Energy_Partners/Generation_Owners/Interconnections_for_Transmission.

6. **Fault Current Study:** The available fault current at Sidewinder Switching Station, which is the Point of Interconnection, without and with any contribution from the new generator facilities, is shown in Table 2.

Table 2, - Available fault current at interconnection location

Short Circuit Information without contribution from new Generator Facilities (GEN 2014-012)				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3–Phase	Z^+	Z^0
230 kV Bus	3,294	2,977	3.09 +j17.45	2.11 +j12.49

Short Circuit Information with contribution from new Generator Facilities (GEN 2012-012)				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3–Phase	Z^+	Z^0
230 kV Bus	4,170	4,139	1.72 +j12.78	2.11 +j12.49

Estimated Construction Costs

The projects required for the interconnection of 186/225 MW Gas Combustion Generator facilities consist of the projects summarized in the table below.

Table 3, Required Interconnection Projects[c]

Project	Description	Estimated Cost
	Shared Network Upgrades	
1	No shared cost upgrades (See IFS-2014-001-06)	$ 0
	Subtotal:	**$ 0**
	Transmission Owner Network Upgrades	
2	Disturbance Monitoring Device (DFR) and Remote Terminal Unit (RTU) and Communication Equipment.	$ 346,745
3	Transmission Line Work (In and Out)	$ 757,506
4	Right-Of-Way	$ 73,653
5	New 3-ring 345 kV Breaker Switching Station (Operated at 230 kV).	$ 9,450,989
	Subtotal:	**$ 10,628,893**
	Transmission Owner Interconnection Facilities (at the Interconnection Customer's expense)	
6	Communications [d]	*$ See footnote*
7	Revenue metering	$ 280,000
8	230 kV Line arrestors	$ 57,375
	Subtotal:	**$ 337,375**
	Total Cost	**$10,966,268**

The restudy DISIS-2014-001 identified a Non-Shared Network Upgrade of rebuilding National Enrichment Plant to Targa to Cardinal 115 kV as an injection constraint for GEN-2014-012/IFS-2014-001-06. This upgrade, which was identified in the SPP 2015 ITP Near Term planning study, will receive a NTC for reliability purposes and the Interconnection Customer will not be responsible for this upgrade.

Engineering and Construction:

An engineering and construction schedule for this project is estimated at approximately 36 months. Other factors associated with clearances, equipment delays and work schedules could cause additional delays. The schedule is applicable after all required agreements are signed and internal approvals are granted.

All additional cost for work not identified in this study is the sole responsibility of the Interconnection Customer unless other arrangements are made.

[c] The cost estimates are 2015 dollars with an accuracy level of ±20%.

[d] It is the Requester's responsibility to provide both the data circuit and both dial-up telephone circuits, see Section 1.13.

Appendix A

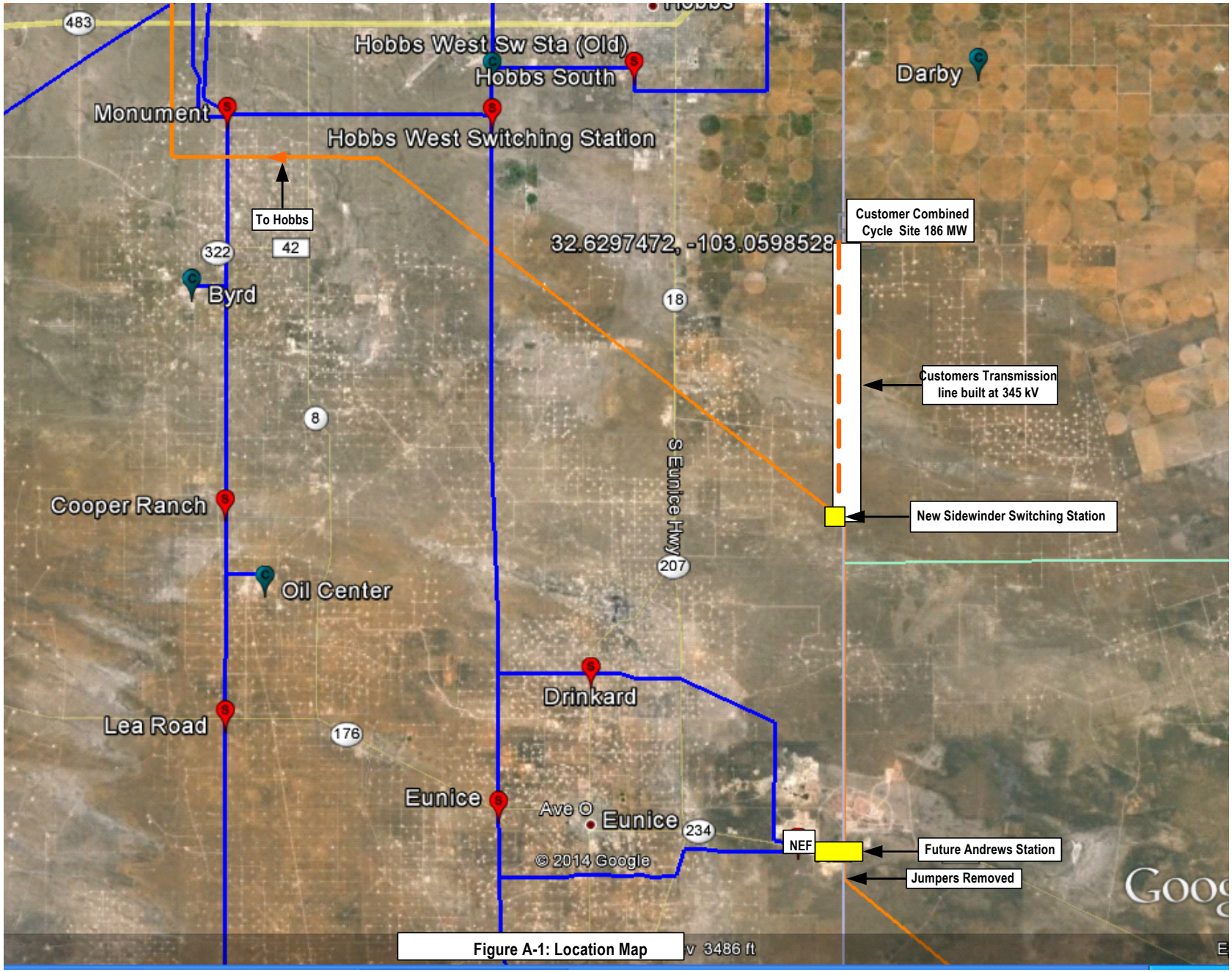


Figure A-1: Location Map

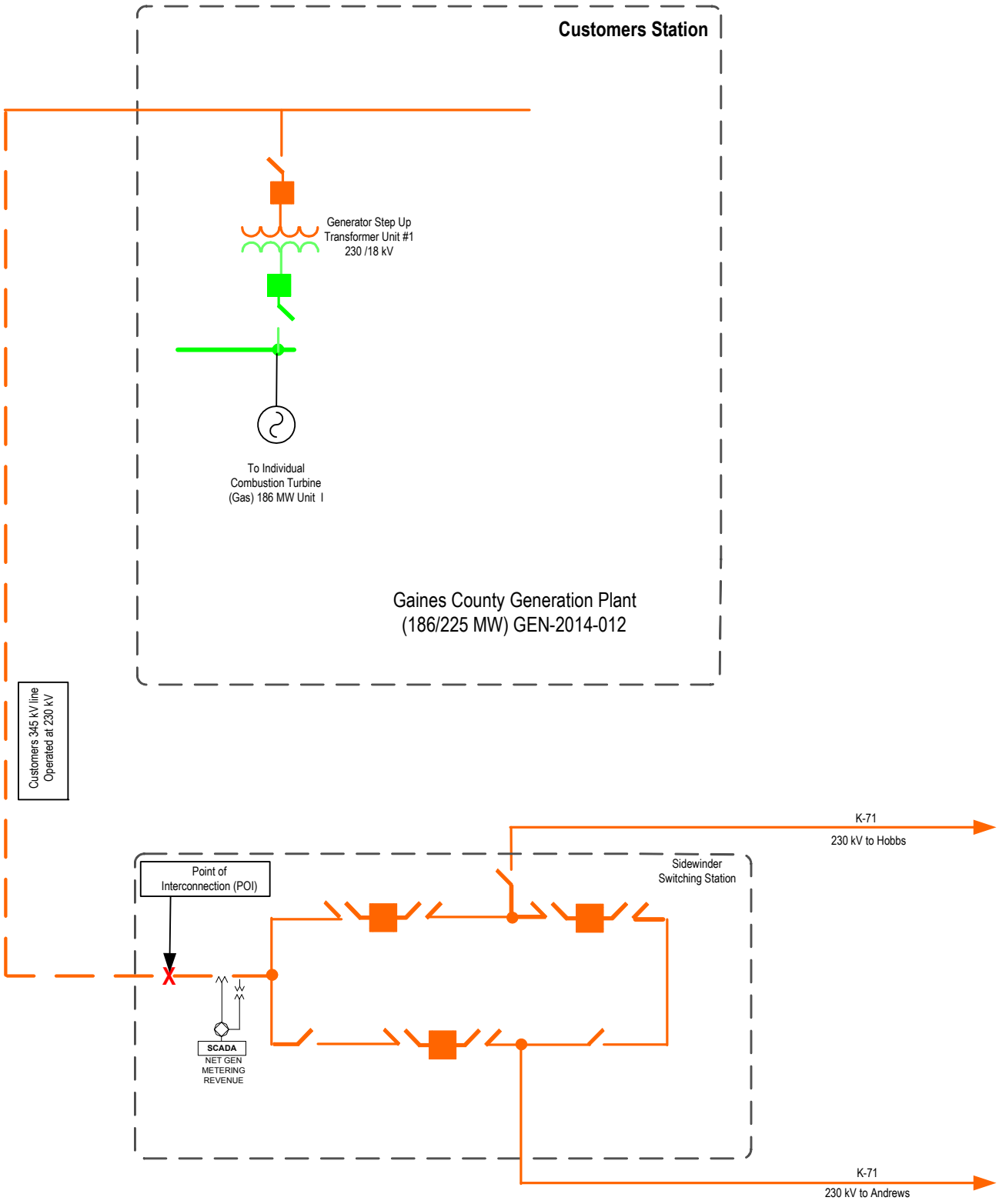


Figure A-2 One-line Diagram of Customers New Substation to Sidewinder Switching Station

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